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Life is swell

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Exposure to the beach, effects on well-being and HR implications

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Abstract

The following paper analyses the role of nature for the restoration of attention and wellbeing of university students. Drawing on theories of Attention Restoration, Cognition and Wellbeing an integration of blue spaces as a HR intervention was proposed. A pre/post two group design was employed, in which the condition group was led in their class break to a mindfulness walk alongside the ocean, whereas the control group walked in an urban setting. A significant increase of positive affect and decrease of arousal was found. However, a significant increase of cognitive performance was not found.

Keywords (minimum of four)
Restoration, Blue Space, Wellbeing, HR-intervention

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Introduction

A study by Knight Frank in the UK showed that the price of a waterfront home was 26-66% higher than a similar property 5 miles inland (Nichols 2015). Various studies have given more evidence for the existence of a water premium (Seiler et al. 2001; Major et al. 2003; Luttik 2000). One possible explanation for why buyers are willing to increase their price for the opportunity to live close to a water front could be that humans "possess an innate tendency to seek connections with nature" (Rogers 2019) as proposed by the Biophilia hypothesis. Empirical research has suggested that spending time in nature can have positive benefits for our health and wellbeing as recently shown in the study by White et al. (2019). The experiment concluded that spending at least 120 minutes a week in nature has significant positive impact on reported health and wellbeing (White et al. 2019). However, the global natural areas are rapidly decreasing through increasing urbanization and the loss of 10% of the earth's wilderness areas within the last 20 years (Johnston 2016). In the latter, this thesis seeks to show the importance of natural spaces in the context of Human Resources (HR) exemplified with possible practical implications for the Nova school of business and economics (NOVA SBE). Mainly it tries to answer the research question: Do the location of breaks matter?

A recent study that examined daily activities of employees found that people take breaks throughout the work day in order to decrease negative affect and fatigue and a significant augmentation of positive effects was shown through within-day work breaks (Zhu et al. 2018). Additionally, taking a respite in your day by doing "restful and enjoyable activities" (Trougakos et al. 2008, p. 139) during breaks can have positive effects on one's emotional state as well as on one's positive affective display. Moreover, employees often utilize micro-breaks as energy management strategies "that are not directly related to doing work" (Zacher et al. 2014, p. 288). However, little is known about how the physical environment of such breaks can affect the quality of the break itself. A quasi experimental HR-intervention is presented in order to explore whether breaks in natural settings can be more beneficial for the restoration of

attentional resources and wellbeing than breaks in an urban setting. Strategic use of NOVA SBE's geographical closeness to the ocean both for its students and employees are discussed.

Literature Review

Restorative qualities of natural environments

There are two main theories that explain the restorative benefits through exposure to natural environments: The Attention Restoration Theory (Kaplan, 1989; 1995) and the Stress Reduction Theory (Ulrich et al., 1991). The Attention Restoration Theory (ART) examines the cognitive benefits through contact with natural surroundings (Joye 2018). Whereas the Stress Reduction Theory (SRT; Ulrich et al., 1991) explains how "contact with nature can reduce (psychological) stress in individuals" (Joye 2018, p. 1). Below I explain in detail how natural environments are restorative using the ART. The ART predicts that our attentional resources are finite and prone to be depleted. According to Kaplan et al. (1995) certain surroundings e.g. natural environments have superior qualities to restore attentional fatigued individuals. Individuals attend to external stimuli using either directed and non-directed attention (James, 1892; Kaplan, 1989). Recent research has supported this classification both "behaviorally […] and neurally" (Berman 2008, p. 1207).

Directed-attention relates to the effortful focus on a cue, while exercising willpower to resist other competing stimuli. In contrast, non-directed-attention refers to stimuli/cues that capture our attention effortless (Kaplan 1989). Ohly et al. (2016) gives the example of filling in a tax return while your children play in the yard. In this case, an effort is needed to suppress the stimuli from the children playing in the yard to execute a task which embodies little motivation for most people.

The ART explains that "natural stimuli are intrinsically fascinating in a way that evokes a type of attention that does not require effortful fixation or cognitive effort" (Stevenson et al. 2018, p. 231). Here, our attention engages voluntary towards stimuli that possess fascination. Thus,

we do not exercise effort to remain focused and consequently spending time in environments that contain such intrinsically fascinating stimuli restores our directed-attention resources.

A natural environment is not necessarily the only setting applicable. However, natural environments are particularly satisfying the four components of restorative environment that were suggested by Kaplan et al. (Stevenson et al. 2018). Kaplan et al. (1995) proposed four defining characteristics of restorative environments: being away, soft fascination, extent and compatibility with one's goals.

Empirical research regarding the valuation of these four components suggested by Kaplan et al. (1995) finds that people report higher feelings of being away, soft fascination, extent and compatibility with one's goals when they are in a natural setting compared to when they are in an urban setting. This result also holds for when the settings are experienced indirectly through imagination or viewed in pictures (Felsten 2009). Particularly, Felsten found that when students were shown different sets of images of possible break locations on their campus, images without natural elements were perceived as less restorative and photographs incorporating natural views especially those including water were rated as more restorative.

Furthermore, White et al. (2010) demonstrated that pictures containing water were judged as the most restorative with aquatic-green environments receiving the highest preference. Moreover, Lee et al. (2015) showed that viewing for 40 seconds a natural scene improves the directed-attention of participants in contrast to a decline in the urban environment, and the natural scene was also perceived as more restorative. A positive correlation between the objectively measured and perceived greenness of an environment was also found in a study on Turkish and American college students (Gulwadi et al. 2019). Besides having a restorative quality, natural environments also have a restorative potential in which the restorative quality is highest for people who need it the most. Specifically, a study on the restoration potential of Californian beaches found that the most fatigued individuals also gave the highest restorative ratings (Hipp et al. 2011). Thus, I hypothesize the following:

Hypothesis 1: The perceived restorativeness of the location for the condition should be significantly higher than in the control group.

Wellbeing, nature and within-day breaks

A more detailed account of wellbeing and its relationship to nature and within-day breaks is given in the following section.

Firstly, there is empirical evidence indicating a positive link between nature and wellbeing. A study with recovering breast cancer patients was conducted and it was found that the experimental group which had at least three restorative experiences like a walk in nature, showed significant improvements regarding attentional performance as well as significant increases in quality of life ratings compared to a waitlist control group (Kaplan 1995). Furthermore, physical exercise through walks in a natural environment in a controlled laboratory context has been shown to improve emotional wellbeing (Kinnafick et al. 2014). Additionally, a survey examining the relation between campus greenness and life satisfaction for Turkish and American university students supported a positive correlation between perceived restorativeness of the environment and quality of life ratings (Gulwadi et al. 2019). Lastly, White et al. (2010) demonstrated that environments containing water increases positive affect. Thus, I hypothesize that:

Hypothesis 2: The valence of mood is more positive in the condition group than in the control group after the intervention when controlling for pre-intervention valence of mood.

Ulrich (1991, p. 203) suggests that "recreation experiences" promote stress recovery e.g. the viewing of an unthreatening natural setting, which consequently lowers physiological arousal.

Ulrich (1991, p. 205) takes an evolutionary perspective concluding that humans are "physiological and perhaps psychological adapted to natural, as opposed to urban" environments. Natural scenes have been shown to promote faster recovery after viewing a stressful movie (Ulrich et al. 1991). Moreover, virtual reality exposure to settings with grass or tree elements significantly lowered stress compared to exposure to concrete elements (Huang et al. 2020). Additionally, urban nature experience's lowered stress by diminishing salivary cortisol (Hunter et al. 2019). Furthermore, Finnish employees with a high exposure to nature profile reported less burnouts (Hyvönen et al. 2018). Lastly, exercise with audio and/or visual natural stimuli improved mood and stress scores when compared to simply resting or exercising without natural stimuli (Wooller et al. 2018). Thus, I hypothesize the following:

Hypothesis 3: The arousal post-break is lower in the natural group compared to the urban group when controlling for pre-break arousal.

Exposure to natural settings and implications for cognition

A more detailed account of the mechanisms of attention as well as a selection of empirical evidence for the propositions of the ART is discussed in the following section. A systematic review by Ohly et al. (2016) concluded that tasks involving a higher degree of working memory were positively affected by restorative experiences in nature (Ohly 2016). Working memory is part of to the executive attention network (Posner et al. 2016). Executive attention is often analysed through conflicting tasks, which require the effortful direction of attention, while suppressing other stimuli (Posner et al. 2007). This seemingly coincides with the notion of non-directed attention within ART. Kaplan et al. (2010) proposed that executive functioning and self-regulation require inhibitory control and share the same resource: directed-attention (Kaplan et al. 2010). Additionally, "recent research has implicated an important role for directed-attention in short-term memory […] and school success" (Berman 2008, p. 1207).

The benefits for cognition through exposure to natural environments has been shown even among different age groups. For instance, elderly living in a retirement home showed improvements in concentration through spending time periods of one hour outdoors (Ottosson et al. 2005). Additionally, research on preschool children displayed a positive relationship between nature exposure and working memory (Ulset et al. 2017). Moreover, Berman et al. (2008) demonstrated that both real exposure through a walk in a natural environment and virtual exposure through viewing photos of natural surroundings improved cognitive performance (Berman et al. 2008). Thus, I hypothesize the following:

Hypothesis 4: The cognitive performance in the condition group will be higher than the control group after the intervention when controlling for pre-intervention cognitive performance.

The perceived restorativeness of an environment "mediated the effects of frequency of nature-based recreation (Korpela et al., 2014) and nature in and around the home (Martínez-Soto, Montero-López-Lena, & Cordova, 2014) on emotional well-being" (Marselle et al. 2016, p. 219). A study by Carrus et al. (2015) suggests that the effects of the exposure length and the biodiversity of the environment on wellbeing are mediated by perceived restorativeness. In the study, higher levels of biodiversity lead to an increase in the perceived restorativeness and it translated into "greater psychological and physical benefit from the environment" (Marselle et al. 2016, p. 219). Thus, I hypothesize the following:

Hypothesis 5A: The effect of condition on cognitive performance is mediated by increased perceived restorativeness of an environment.

Empirical studies suggest that there are "close neural links and a complex, multifaceted, and bidirectional relationship between affect and cognition" (Forgas 2008, p. 99). On the one hand, affect can alter the subject's degree of efficiency, when engaging in cognitive tasks. On the other hand, working memory can intensify or diminish emotional experiences (Mikels et al. 2019). Further empirical research on a non-clinical American population revealed a negative relation between anxiety and working memory performance of the participants (Lukasik et al. 2019). Moreover, a meta-analysis conducted by Moran (2016, p. 47) concluded that "anxiety is robustly associated with poorer inhibition of irrelevant information and may be a mechanism by which anxiety restricts available" working memory. Thus, I hypothesize the following:

Hypothesis 5B: The effect of condition on cognitive performance is mediated by increased valence of mood / positive affect.

In general, lower levels of stress can enhance cognitive functioning "particularly in simple tasks or when the cognitive load is not excessive" (Sandi 2013, p. 255). In contrast, higher levels of stress positively affect "performance on implicit memory tasks, in simple declarative memories and in well-rehearsed task" (Sandi 2013, p. 255)[1]. Yet, memory functions, which rely on complex flexible thinking are deteriorated by stress (Sandi 2013). Moreover, environmental induced stress through having a task overload and time pressure can impair memory capacities (Bourne 2003). Additionally, acute stress impairs all executive functions except of monitoring (Starcke et al. 2016).

Hypothesis 5C: The effect of condition on cognitive performance is mediated by lowered arousal.

[1] Although, it is acknowledged that stress can both enhance and deteriorate cognition depending e.g. on the intensity and duration of stress as well as on the type of cognitive process and "information processing phases" (Sandi 2013, p. 245) involved.

Method

Sample

The sample was composed of sixty-one students of NOVA SBE university, who participated in the study in exchange for the world's best banana bread and the chance to enter a lucky draw to win one of three 50€ vouchers from 'Cartão Dá' (M_{age} = 23.25 years, SD = 2.56, range 21 – 40 years; female = 31 and male = 30). The participants were recruited from two of Professor Samantha Sim's Human Resource Management (HRM) classes in the spring semester 2020.

Study Design

The experiment followed a pre-post test, two group study design with a condition and a control group. Each group would undertake a seven minutes mindfulness walk, which took place during their usual break from class occurring in the midst of the three-hour class. The condition group walked in a natural environment on Carcavelos beach (N = 31), whereas the control group walked in an urban environment alongside the road N6-7 in front of the NOVA SBE compound (N = 30). The assignment of the participants to the condition or control group was not randomized. Participants from the from the earlier HRM class (11am - 2 pm) were assigned by the author to the condition group and the later class (2.30 pm - 5.30 pm) to the control group. Therefore, the study is quasi-experimental, due to its lack of randomization (Harris et al. 2006). Further, to maintain comparability between groups, pre-intervention scores of dependent variables were also assessed and used as control variables.

Procedure

The earlier class (11am - 2 pm) was assigned to the condition by the author and the later class to the control group. This allocation of condition is a more conservative test on the restorative potential of the setting. Although we might expect that cognitive load is accumulating during the day, such that the worse cognitive performance of the control group can be explained more by the timing of the day rather than the effect of the setting, the effect of interest is the

restoration of cognition and mood. Within the field of ART, most studies commence by imposing an exercise, which creates "a state of attentional fatigue in them" (Joye et al. 2018, p. 3), in order to increase the restoration potential, which in turn "should provide a more reliable restoration effect" (Stevenson et al. 2018, p. 264). Relatedly, the first HRM class was assigned to the condition group, despite the fact that their restorative potential might be lower. Thus, the validity of the argument for the potential restorative benefits through exposure to natural environments would be increased, if a significant difference between the control and condition group in cognitive performance after the intervention exists even with a condition group that is presumably less fatigued than the control group.

On the day of the experiment, the weather was mostly sunny with more clouds towards the afternoon with a maximum temperature of nineteen degrees during the day ("Weather Archive Lisbon" 2020). As demonstrated by Hipp et al. (2011), the environmental factors like temperature, air and water quality influence the perceived restorativeness of beaches. For instance, a higher air and water quality as well as an ambient temperature below the mean monthly temperature increases the perceived restorativeness.

Each class received a short presentation regarding the experiment explaining that participation was voluntary, but it would enable them to enter a lucky draw for the above-mentioned vouchers as well as receiving a piece of chocolate-banana bread. These benefits for the participants were provided to increase the motivation to participate, since they were using their break from class. Additionally, the structure of the experiment was explained where participants were briefed on the pre-survey, the activity of a mindfulness meditation outdoors and post-survey. Furthermore, they were asked to refrain from some of their usual break activities such as talking to their colleagues, engaging with their smartphone, drinking caffeine beverages as well as using the bathroom. Nevertheless, the students were asked to refrain from these activities only during the mindfulness walk and they were free to drink and eat on the way to the outside location. Consequently, students who would not like to participate were

asked to leave the room and to return after the break. It was emphasized that participation had no consequence on their course grade, and this was not the regular Nova Behavioral Lab participation for bonus credit.

Participants completed a pre-intervention initial cognitive and affect baseline survey, which was followed by a mindfulness walk outside and concluded the post-intervention with a survey comprising of the same cognitive and affect measurement. On the way to the location for the walk, the participants were allowed to engage in the above described activities e.g. talking to their colleagues during the way to the mindfulness walk site. The earlier HRM class was accompanied to the ocean. Whereas in the later class, the control group was walked to the urban location alongside the road N6-7.

Both groups received the same mindfulness walk instructions. After seven minutes, both groups returned to the classroom to complete the third part of the experiment. The pre-intervention survey included an affect grid measuring mood and arousal as well as the Digital Span Backwards task (DSB) measuring the cognitive baseline level. The post-intervention survey included the same measures, with the addition of a questionnaire regarding the perceived restorative qualities of the environment, demographic questions (i.e. gender, age) as well as questions investigating their compliance with the mindfulness walk instructions. After completing the survey, a short explanation of the experiment was given and the first class was asked to keep it confidential until the end of the day to avoid any interaction effects with the control group, which would partake in the experiment after the first HRM class was finished at 2 pm.

Mindfulness walk instructions. The instructions for the mindfulness walk exercise were adapted from the website of the meditation app Stop, Breathe & Think ("Mindful Walking - Stop, Breathe & Think" 2017). This was chosen due to its simplicity and shortness, since the experiment was time restricted and the instructions should be as easy to follow as possible. The exact mindfulness instructions used can be found in appendix A1.

Measures

Cognitive performance measure. The cognitive baseline level of each student was measured through the DSB test. The DSB is an established exercise in the ART to measure executive attention. It was utilized to evaluate visual and auditory contributions regarding the restorative effects on the cognitive performance of university students (Emfield et al. 2014) or to measure cognitive performance differences of indoor vs outdoor exercises (Rogerson et al. 2016) as well as to evaluate cognitive performance changes for people with psychological distress (Triguero-Mas et al. 2017).

In this task, participants were shown an alternating number sequence and they had to recall the number sequence in the reverse order. At first, a test-sequence was shown to ensure a sufficient understanding of the test procedure. Afterwards, three sequences were shown, starting with a 4-digit sequence, followed by a 5-digit sequence and ended with a 6-digit sequence. Each correct answer yielded one point. Therefore, the maximum score that participants could obtain was three and the smallest possible score was zero. Participants also completed this task when they came back from their break.

Mood and arousal measure. The affect grid (Russel, 1989) measured the initial valence of mood and arousal. The affect grid is a self-reporting tool, which measures "two dimensions of affect: pleasure-displeasure and arousal-sleepiness" (Russell et al.1989, p. 493). Participants are asked to indicate their mood by check-marking one box within the matrix. An example of the effect grid can be found in appendix A2.

Demographic and other variables. Lastly, demographic questions regarding their age and gender as well as a query regarding their last night's sleep were included. Sleep deprivation negatively affects "attention and working memory" (Alhola et al. 2007, p. 553) and was hence considered as a possible confounding variable.

Perceived Restorativeness Scale (PRS). The last measure used relates to the perceived restorative qualities of the environment. Kaplan (1995) proposed four criteria to measure the

restorative qualities of an environment. The first condition refers to “being away” (Kaplan 1995, p. 173) meaning a new or different environment. Moreover, the next criterion relates to “fascination” (Kaplan 1995, p. 173). Kaplan et al. introduce a distinction between soft and hard fascination. On the one hand, hard fascination incorporates the notion of stimuli, which capture one’s attention strongly and make it difficult to resist (Basu 2018). On the other hand, softly fascinating cues are “still capturing attention effortlessly, [yet] do not entirely occupy the space in one’s head” (Basu 2018, p. 1057). Soft fascination brings in Kaplans view, the advantage “of providing an opportunity for reflection, which can further enhance the benefits of recovering from directed attention fatigue” (Kaplan 1995, p. 172). Additionally, Kaplan et al. identify the “extent" (Kaplan 1995, p. 173) as the third condition implicating that it should “be rich enough and coherent enough so that it constitutes a whole other world” (Kaplan 1995, p. 173). The last condition is defined as “compatibility” (Kaplan 1995, p. 173) meaning that one’s objectives and inclinations should fit with the environment.

These four elements are combined to the PRS first suggested by Hartig et al. (1991). The PRS is currently the most applied measurement regarding the restorativeness of environments (Negrín 2017), indicating the importance and acceptance of these four proposed elements. Additionally, the PRS was examined and validated by Hartig et al. (1997, p. 175) across “different subject populations (American, Swedish, Finnish) and presentation modes (on-site, video, photographic slides)”.

Although, the PRS has been widely used in the ART literature, its “psychometric and factorial properties […] [are] not well established” (Pasini et al. 2014a, p. 293). Thus, the PRS-11 a shorter version proposed by Pasini et al. (2014) is employed in this thesis, since it has been tested through a confirmatory factor analysis. Moreover, the scale reliability analysis for the PRS-11 in this thesis revealed a cronbach alpha of 0.899 and a detailed overview with each individual item can be found in appendix A3.

Results

Correlations

Some significant correlations of interest are discussed below (see appendix A4 for all M's, SD's and correlations). Firstly, $R_{COND\text{-}PRS}$ = 0.75** shows preliminary evidence for hypothesis 1. Moreover, $R_{COND\text{-}VAL\ POST}$ = 0.35** shows preliminary evidence for hypothesis 2. Additionally, $R_{ENERG\ POST\text{-}COND}$ = -0.31* shows preliminary evidence for hypothesis 3. Furthermore, $R_{COND\text{-}CT\ POST}$ = 0.31* shows preliminary evidence for hypothesis 4.

$R_{difficulty\ of\ instructions\text{-}condition}$ = -0.47 shows that the mindfulness walk instructions were less difficult to follow in the ocean setting, and perhaps it is easier to calm the mind at the ocean than alongside a busy urban street. $R_{CT\ PRE\text{-}COND}$ = 0.3* shows that the initial cognitive test scores were higher for the experimental group. This could be due to the experimental group being less exhausted, since they were tested 3 hours earlier in the day than the control group. $R_{CT\ Post\text{-}sleep}$ = -028* reflects previous research that sleep deficit leads to poorer cognitive performance.

$R_{CT\ PRE\text{-}CT\ POST}$ = 0.51** shows that initially high scoring participants also performed well in the in the cognitive test after the walk. $R_{VAL\ PRE\text{-}CT\ POST}$ = 0.36** shows students with an initial positive mood, performed better in the cognitive test after the walk. Perhaps participants with a more positive initial mood were more able to dive into the mindfulness walk, which in return improved their CT POST score. $R_{VAL\ PRE\text{-}VAL\ POST}$ = 0.66** shows that the pre-break valence predicts post-break valence. $R_{VAL\ PRE\text{-}ENERG\ POST}$ = -0.29* shows that participants with more positive initial feelings were calmer after the walk and possibly more receptive to the mindfulness walk. $R_{ENERG\ POST\text{-}VAL\ POST}$ = -0.4** shows that students, who felt calmer after the walk were reporting higher levels of positive feelings.

$R_{PRS\text{-}Difficulty\ INSTRUCTIONS}$ = -0.46** shows that the mindfulness walk instructions were less difficult to follow when the setting was perceived as more restorative, suggesting that places perceived as restorative can increase our ability to follow instructions. $R_{PRS\text{-}VAL\ POST}$ = 0.34*

and $R_{PRS\text{-}ENERG\ POST}$ =-0.28* shows that the more participants perceived the setting as restorative, the more positive and calm they felt. $R_{DISTRACT\text{-}AGE}$ = 0.45** shows that older students reported more distractions such as eating and drinking during the walk. $R_{DISTRACT\text{-}ENERG\ POST}$ = 0.35 shows that participants that reported higher level of energy after the walk were more likely to report more distractions during the walk. $R_{CT\ PRE\text{-}Male}$ = 0.32** shows that male participants scored higher in the initial cognitive test.

ANOVA analyses

A one-way ANOVA was performed to test hypothesis 1, whether the PRS was higher for the condition group than the control group. There was a statistically significant difference between groups as determined by a one-way ANOVA (*F* (1, 59) = 74.51, p < .001**, partial eta squared = 0.56), such that the condition group scored higher (M = 4.03, SD = 0.47) than the control group (M = 2.54, SD = 0.83). Thus, evidence was found for hypothesis 1 and the detailed results are presented in appendix A5.

Regression analyses

Regression analyses regarding Post-intervention Mood Valence Scores

Linear regression analyses were performed to evaluate whether the mood valence scores (VAL POST) after the intervention were significantly higher in the condition group relative to the control group. Model 1 includes Valence Pre (VAL PRE) as the independent variable, model 2 includes VALE PRE and condition (COND, 0 = control group, 1 = condition group) as the independent variables. Model 3 VAL PRE, COND and Sleep as the independent variables. Model 4 contains VAL PRE, COND, Sleep and Distract as the independent variables.

The results of regression analyses for post intervention mood valence are shown in the appendix A6. Of note, the model 2 has a R^2 value of 0.7 (R^2 change = 0.05, F-change = 5.76, p = 0.02*). The effects of pre-intervention mood valence and condition are positive and significant (**VALENCE PRE**: B = 0.68, p < 0.01**, CI [1.08, 1.83]; **COND**: B = 0.86, p =

0.02*, CI [0.13, 1.59]). Model A3 & A4 show that the inclusion of the variables Sleep and Distract did not affect the result and they failed to be significant predictors. In sum, students who took their break in the ocean environment displayed a significant mood increase through the mindfulness walk compared to the control group in the urban setting when pre-intervention mood valence, sleep and distract is taken into account, providing evidence for hypothesis 2.

Regression analyses regarding Post-intervention Mood Arousal Scores

Linear regression analyses were performed to examine whether the mood arousal scores (ENERGY POST) after the intervention were significantly lower in the condition group relative to the control group, that is if students were calmer in the ocean environment relative to the urban setting. The models B1-B4 have the exact same independent variables, with pre-intervention arousal score (ENERGY PRE) instead of VAL PRE (see appendix A7). The results of regression analyses for post intervention mood valence are shown in the appendix A7. Of note, model 2 has a R^2 value of 0.36 (R^2 change = 0.131, F-change = 17.31, $p < 0.01$**). The effects of pre-intervention mood arousal and condition are significant (**ENERGY PRE**: B = 0.06, p = 0.65, CI [-0.22, 0.34]; **COND**: B = -1.93, $p < 0.01$**, CI [-2.87, -0.98]) indicating that pre-intervention arousal is positively related to post-intervention arousal while being on the ocean is negatively related to post intervention mood arousal even when pre-intervention mood valence is taken into account. The inclusion of the variables Sleep and Distract did not affect these main result (see model B3 & B4). However, the distract variable appears to be a significant predictor (**Distract** B = 1.03, p = 0.02*, CI [0.20, 1.86], model B4) such that participants who engaged less in the excluded activities had greater benefits from the mindfulness walk. In sum, even controlling for pre-intervention arousal scores, Sleep and Distract, students in the ocean environment were calmer after the mindfulness walk relative to the participants in the urban setting as can be seen in the coefficient of COND (B = -1.93, $p <$ 0.01**, **, model B2), providing evidence for hypothesis 3.

Preliminary analysis on Pre-intervention Cognitive Performance Scores

Stevenson et al. (2018) recommend the use of an ANCOVA for studies using a pre/post design with a randomized group assignment with the covariate being the cognitive baseline scores. However, the presented thesis assignment was not randomized. Lomax et al. (2001) suggest that non-randomized designs are liable to violate the assumption that the covariate is independent from the treatment effect. Consequently, a preliminary analysis was performed in order to test whether the covariate is independent from the treatment effect being one of the assumptions of an ANCOVA.

An ANOVA with the CT PRE as the independent and COND as the dependent variable was conducted and a significant effect of condition was found ($F = 6.25$, $df = 1$, $p = 0.02$*), where the condition group had higher pre-intervention cognitive performance ($M = 2.32$, $SD = 0.91$) than the control group ($M = 1.69$, $SD = 1.13$) for a detailed overview view appendix A8. Miller et al. (2001) put forward that an ANCOVA with group differences for the covariate contains substantive, interpretative as well as mathematical issues. Thus, a regression analysis was chosen instead of an ANCOVA by the author to test hypothesis 4, since the covariate showed significant differences between the groups as shown in A8

Regression analyses regarding Post-intervention Cognitive Performance Scores

The regression analysis was executed to test hypothesis 4 if a significant difference in regard to the cognitive performance after the walk was observable for the condition. The model one is composed of the cognitive post test score (CT POST) as the dependent variable and cognitive pre-test score (CT PRE) as the independent variable. Model 2 shows a R^2 value of 0.29 (R^2change = 0.03, F-change = 2.35, $p = 0.13$). The coefficient of COND in model 2 is nonsignificant ($B = 0.34$, $p = 0.13$, CI [-0-1, 0.77]). Therefore, there is no evidence to support hypothesis 4. The model and coefficients are shown in the appendix A9.

Mediation analysis

A mediation analysis was conducted employing the PROCESS macro from Andrew F. Hayes in the version 3.4.1 (Hayes 2017) to test the mediational hypotheses 5A, 5B and 5C. The variables PRS, VALENCE POST and ENERGY POST were entered as parallel mediators, with CT POST as outcome and COND as control variable. The results for mediation were not significant (see appendix A10), no evidence for hypotheses 5A, 5B and 5C were found.

Discussion

The purpose of this research was to examine, whether exposure to a natural environment through a seven minutes mindfulness walk could improve the wellbeing and cognitive performance of the students in the condition relative to the control group. A significant enhancement of the student's mood in the condition could be demonstrated, students in the ocean group reported more positive valence and lower arousal than the control group. In other words they experienced a more pleasant and calmer mood. However, a significant change regarding the cognitive performance could not be found.

Theoretical implications

The presented thesis has several contributions. Firstly, to the author's knowledge, this is the first experimental study employing actual natural aquatic environment in order to investigate its effects on wellbeing and cognition. Previously, Rogerson et al. (2015) compared the benefits for stress, mood and self-esteem through outdoor exercises in natural environments employing a pre/post-test design failing to compare urban vs natural settings, but instead compared different natural environments. So far, research has examined water and its restorativeness by investigating preferences of water vs green urban settings through pictures (White et al. 2010; Felsten 2009), videos (Karmanov et al. 2008) and surveys (Hipp et al. 2011). Thus, this research utilized exposure to an actual aquatic environment to measure its restorativeness relative to the urban setting.

Other previous studies examining the relationship between water and wellbeing have utilized correlational methods such as census surveys to investigate the effects of proximity to the coast (Wheeler et al. 2012; Mavoa et al. 2019), amount of water in the area (Mavoa et al. 2019), access (Triguero-Mas et al. 2015) as well as distance and presence of blue space in the neighbourhood (Dzhambov et al. 2018) and frequency and time spend in green spaces and beaches (Amoly et al. 2014). Correlational results such as time spent in nature and wellbeing are biased due to the amount of time between the occurrence of an event and its recall "are correlated with errors in retrospective recall." (Biemer et al. 2004, p. 133). The present research presents quasi-experimental evidence that supplements the internal validity of these correlational research. Particularly, the immediate response to the aquatic exposure in the presented experiment does not involve a time lag as is likely in census data.

Relatedly, most research investigating the effects of water on wellbeing employed cross-sectional studies (e.g. White et al. 2013; Amoly et al. 2014; Triguero-Mas et al. 2015; Mavoa et al. 2019) which are non-experimental and are lacking a control group (Macha et al. 2012). Moreover, cross-sectional studies simultaneously measure effect and exposure. Thus, there is no indicator that the treatment is the antecedent of the effect (Carlson et al. 2009). Consequently, "there is generally no evidence that the exposure caused the outcome" (Carlson et al. 2009, p. 78). Thus, utilizing a quasi-experimental design strengthens the argument for the causal relation between exposure to water and increased wellbeing.

Practical implications

Wellbeing at work is gaining in significance and increasingly more companies focus on advancing the wellbeing of their workers. For instance, in 2015 5-8% of US healthcare cost were related to workplace stressors e.g. long working hours and low organizational justice (Goh et al. 2016). However, only a small part of the organizational research has examined the effects of the work environment on its employees (An et al. 2016). Nevertheless, "it is important to consider the work environment as a causal and remedial factor in employee health" (An et al.

2016, p. 1). Office spaces with day light and views on nature have been found to reduce sick leave hours (Ihab M. K. Elzeyadi 2011), increase productivity and work engagement (Nieuwenhuis et al. 2014).

To understand the practical relevance of this at NOVA SBE, a follow-up survey was conducted regarding the activities that NOVA SBE students perform to recharge their energy, when they are fatigued at university (N = 51, M_{age} = 22.88 years, SD = 1.78, female = 30, male = 22). A majority of 58.8 % of the respondents never or only sometimes go to the ocean to restore their energy. Consequently, it seems that NOVA SBE's strategical location next to the ocean is not yet used to its fullest potential. By building the new campus next to ocean, NOVA SBE seeks to "attract applicants to a coast like lifestyle" (NOVA SBE 2017) aiming for an "Californian Lifestyle with Ideology" (NOVA SBE 2017). Consequently, NOVA SBE seeks to incorporate an outdoor appreciating culture. Yet, according to the survey it seems that there are still possibilities to enhance the integration and appreciation of the ocean environment within NOVA SBE's culture.

A prominent example of a company, which seeks to integrate and promote being outdoors is Patagonia. Patagonia achieved an outstanding employer branding through their focus on spending time in nature and the protection of the environment. For instance, Patagonia's founder Yvon Chouinard introduced the concept "Let My People Go Surfing flex time policy" (Chouinard 2006, p. 342), which allows for flexible working hours contributing to the strong employer branding resulting in "an average of nine hundred applicants for each job opening" (Chouinard 2006, p. 340-341). Patagonia improves its employees' job satisfaction through these flexible work arrangements, which benefits particularly surfers, climbers and many other outdoor sportsmen, since it increases their ability to integrate their hobbies with their work. Additionally, Patagonia is selling outdoor apparel and clothing (Patagonia n.d.). Consequently, a workforce that is passionate about outdoor sports can authentically represent the brand.

Regarding NOVA SBE, the closeness to the ocean could be utilized as a source for differentiation in employer branding. Similar, NOVA SBE could integrate flexible work hours expect for in-class teaching hours to attract employees to a coast like lifestyle. Equally, NOVA SBE could attempt to increase the flexibility of their study program e.g. the professional development modules can only be done during the semester breaks. However, these semester breaks are used by fellow students to do outdoor travel trips and hence conflicts arise with the study program.

Lunch breaks have been linked to improved wellbeing through relaxation and relating to others (Bosch et al. 2017). Moreover, lunch breaks with colleagues have been shown to increase the reported energy at the end of the day (Von Dreden et a.l 2017). Additionally, walks in natural settings are linked to increased emotional wellbeing (Kinnafick et al. 2014). Hence, NOVA SBE could organize a monthly lunch break at one of the restaurants at the beach and integrate e.g. a walk alongside the ocean after the lunch. The shared lunch would promote a sense of community, which enhances team collaboration (Frisch 2011) as well as utilizing the restoration potential of both the ocean and the break itself.

Lastly, possible student wellbeing measures for the university could translate into raising the awareness of having the ocean in front of our doorstep. For instance, the welcome week could incorporate activities at the beach. Moreover, walking to the ocean involves taking the time for it. Hence, NOVA SBE could create a longer mid-day break as well as creating a campaign overcoming the employees' and students' perception of not having enough available time for a break alongside the ocean, since breaks and within-day breaks are necessary to enable a full recovery of one's work performance (Trougakos et al. 2009).

Limitations

Alongside its strengths, the presented experiment had several shortcomings that future research may address. Firstly, a randomization of the condition was not possible. Randomized trials are considered as containing greater internal validity, since quasi-experimental design studies

possess “an inability to sufficiently control for important confounding variables" (Harris et al. 2006 p. 18). Besides, non-randomized trials are liable to a “selection bias” (M.K 2020).

Secondly, the scatterplot of the CT POST regression analysis revealed a bias (see appendix A11) and a power analysis showed that the experiment was underpowered (see appendix A12).

Future research

In conclusion, the present research finds evidence in support of utilizing the natural environment during breaks to improve mood and hopes that stimulates more future research in this area of wellbeing. The present research utilizes a one-shot intervention of going to the ocean. One natural extension of inquiry is whether and how repeated exposure to natural environments affects mood. One potential reason for the improved mood is that the ocean is novel (given that many students do not frequently go to the ocean), but walking in the urban environment to the train station is a daily occurrence. Future research can examine how moods can fluctuate within-day due to exposure to the ocean.

Moreover, previous research investigating the link between mindfulness and the ART showed that open monitoring mindfulness exercises can be facilitated through exposure to nature for beginner practitioners (Lymeus, et al. 2016). Open monitoring approaches refer to an expanded moment to moment awareness (comp Lymeus, et al. 2016), which do not require a specific focus of attention e.g. on the breath or a mantra. The open monitoring techniques allows the mind to observe stimuli in the present. It could be facilitated by natural cues that are moving one’s attention effortlessly to the present supporting “a sense of being away from stressors, demands, and routine mental contents, [which] can facilitate mindful detachment” (Lymeus et al. 2018, p. 42). Thus, future research could compare in a randomized experiment with an enlarged sample size, whether the ocean environment facilitates mindfulness for beginner practitioners compared to the urban environment e.g. inside the university’s compound. Moreover, as most research in the ART the analysed sample contains only students and hence

possesses low external validity (de Bloom et al. 2014). Future research could aim for a randomized controlled experiment with a more diverse sample.

Lastly, recent criticism regarding the standardization of tests and measures within the ART (Stevenson et al. 2018) as well as the operationalization of components of the PRS (Joye 2018) surfaced and further research could address both the standardization of tests as well as the operationalization of the theory. For instance, the DSB was chosen for this thesis as the cognitive baseline measure, since exercises involving a higher degree of working memory e.g. the DSB were positively affected by restorative experiences in nature (Ohly 2016). However, information about the exact specifics of the DSB were difficult to obtain. It was unclear how many number sequences should be shown as well as how long each number should be shown before the next one appears for the participants.

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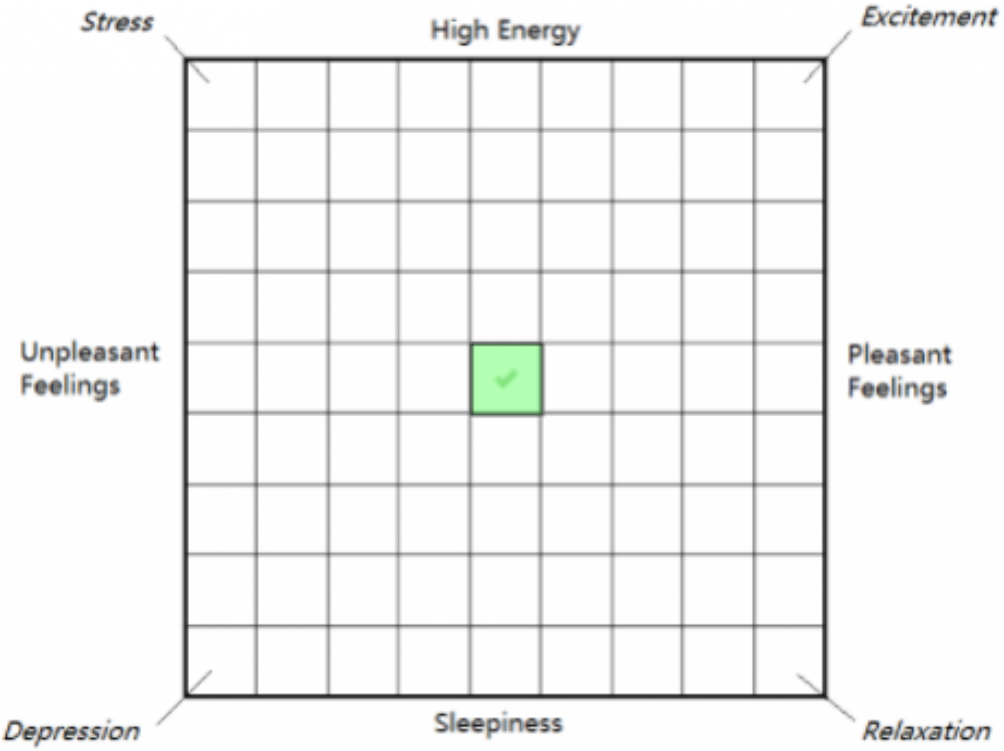
Appendix

A1) Mindfulness walk instructions

retrieved from (https://www.stopbreathethink.com/mindful-walking/)

- As you walk, notice how your body feels.
- Pay attention to how your legs, feet and arms feel with each step you take.
- Feel the contact of your foot as it touches the ground, and the movement of your body as you move into your next step.
- If you become lost in thought as you continue to walk, use the next step as an opportunity to start over.
- Now using your sense of sight, look around and try to notice every detail.
- Using your sense of smell, notice any aromas or scents.
- Are you able to notice any tastes as you walk? Can you taste the air?
- Now using your sense of touch, notice the solidity of the earth beneath your feet.
- With openness and curiosity, notice any sensations, thoughts or feelings that arise, without lingering on anything in particular.

A2) Affect grid



A3) PRS scale reliability analysis

Item-Total Statistics

How did you experience the location? Please answer regarding how you perceived the location.	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Places like that are fascinating	32.74	94.40	.81	.88
In places like this my attention is drawn to many interesting things	33.02	101.85	.63	.89
In places like this it is hard to be bored	32.93	99.36	.73	.88
Places like that are a refuge from nuisances	32.75	96.36	.78	.88
To get away from things that usually demand my attention I like to go to places like this	33.07	95.30	.80	.88
To stop thinking about the things that I must get done I like to go to places like this	33.10	96.09	.75	.88
There is a clear order in the physical arrangement of places like this	33.43	108.35	.44	.90
In places like this it is easy to see how things are organised	33.34	112.03	.32	.91
In places like this everything seems to have its proper place	32.77	111.01	.37	.90
That place is large enough to allow exploration in many directions	32.67	103.56	.59	.89
In places like that there are few boundaries to limit my possibility for moving about	32.97	100.20	.68	.89

Reliability Statistics

Cronbach's Alpha	N of Items
.899	11

A4) Correlation Matrix

		Mean	SD	N	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Age	23.25	2.56	61													
2	Slepp	6.95	1.27	61	-.01												
3	COND	.47	.50	66	-.05	.04											
4	Difficulty of instruc	0.57	.83	61	.25	-.02	-.47**										
5	CTPRE	1.98	1.07	66	.09	-.05	.30*	-.02									
6	CTPOST	2.23	.99	66	.23	.29*	.31*	-.14	.51**								
7	VALPRE	.03	2.10	64	.21	.23	.24	.02	.17	.36**							
8	VALPOST	1.62	1.85	61	.09	.05	.35**	-.05	-.03	.11	.66**						
9	ENERPRE	.23	1.84	60	.19	-.04	-.13	.02	-.18	-.24	-.04	-.17					
10	ENERPOST	.34	1.65	61	.20	.00	-.31*	.21	.09	-.19	-.29*	-.40**	.06				
11	PRS	3.3	1.00	61	-.09	-.02	.75**	-.46**	.18	.08	.05	.34**	-.07	-.28*			
12	Distract	1.24	.55	37	.45**	.03	-.14	.14	-.04	-.11	.01	-.21	.26	.35*	.01		
13	Male	.46	.50	66	-.11	-.04	.30*	-.17	.18	.32**	.20	.08	-.19	-.23	.05	-.04	
14	Female	.47	.50	66	.11	.04	-.16	.17	.04	.03	-.06	-.08	.11	.23	-.05	.04	-.86**
** Correlation is significant at the 0.01 level (2-tailed).																	
* Correlation is significant at the 0.05 level (2-tailed).																	

A5) PRS ANOVA

Between-Subjects Factors

		Value Label	N
COND	.00	urban	30
	1.00	ocean	31

Descriptive Statistics

Dependent Variable: PRS

COND	Mean	Std. Deviation	N
urban	2.54	.83	30.00
ocean	4.03	.47	31.00
Total	3.30	1.00	61.00

Tests of Between-Subjects Effects

Dependent Variable: PRS

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	33.71[a]	1.00	33.71	74.51	.00	.56
Intercept	658.44	1.00	658.44	1455.41	.00	.96
COND	33.71	1.00	33.71	74.51	.00	.56
Error	26.69	59.00	.45			
Total	723.91	61.00				
Corrected Total	60.40	60.00				

a. R Squared = .558 (Adjusted R Squared = .551)

A6) Regression analyses regarding Post-intervention Mood Valence Scores

DV: Valence score after the walk	Model 1		Model 2		Model 3		Model 4	
	ß	t	ß	t	ß	t	ß	t
Constant	1.45	7.79**	1.04	4.21**	1.69	1.46	2.42	2.07*
Valence PRE	.72	7.98**	.68	7.75**	.69	7.43**	.70	7.79**
Condtition			.86	2.40*	.87	2.40*	.77	2.19*
Sleep					-.09	-.58	-.08	-.52
Distract							-.62	-1.95
R2		.65		.70		.70		.73
△R2		.65		.05		.00		.03
F-Statistic		63.70		5.76		.33		3.79
p (Sig of F)		**.00****		**.02****		.57		.06
*p < 0.05, **p < 0.01								
ß refers to the unstandardized B								

A7) Regression analyses regarding Post-intervention Mood Arousal Scores

DV: Energy score after the walk	Model 1		Model 2		Model 3		Model 4	
	ß	t	ß	t	ß	t	ß	t
Constant	.32	1.11	1.23	3.82*	1.57	1.08	.59	.42
Energy PRE	.13	.78	.06	.46	.06	.43	-.03	-.20
Condtition			-1.93	-4.16**	-1.92	-4.08**	-1.81	-4.16**
Sleep					-.05	-.24	-.10	-.51
Distract							1.03	2.54*
R2		.02		.36		.36		.48
△R2		.02		.34		.00		.11
F-Statistic		.61		17.31		.06		6.44
p (Sig of F)		.44		**.00****		.81		**.02****
*p < 0.05, **p < 0.01								
ß refers to the unstandardized B								

A8) Preliminary analysis CT PRE (Testing ANCOVA assumption)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.30[a]	.09	.07	1.03

a. Predictors: (Constant), COND

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.67	1.00	6.67	6.25	.02[b]
	Residual	68.32	64.00	1.07		
	Total	74.98	65.00			

a. Dependent Variable: CTPRE

b. Predictors: (Constant), COND

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.69	.17		9.65	.00
	COND	.64	.25	.30	2.50	.02

a. Dependent Variable: CTPRE

A9) Regression analyses regarding Post-intervention Cognitive Performance Scores

DV: Cognitive Score after the mindfulness walk	**Model 1**		**Model 2**	
	ß	**t**	**ß**	**t**
Constant	1.29	5.80**	1,23	5.47**
CT PRE	.47	4.75**	.42	4.12**
Condition			.34	1.53
R2		.26		0.29
ΔR2		.26		.03
F-Statistic		22.52		2.35
p (Sig of F)		**.00****		0.13

*p < 0.05, **p < 0.01

ß refers to the unstandardized B

A10) Mediation analysis

	Mediation Test		
	B	**SE**	**t**
Predicting Mediator Perceived Restorativeness Scale			
Constant	2.51	.21	11.79**
Condition	1.48	.18	8,32**
Cognitive Pre-Score	.02	.09	.19
Predicting Mediator Valence Post			
Constant	1.37	.55	2.50*
Condition	1.38	.46	3.02**
Cognitive Pre-Score	.21	.23	.90
Predicting Mediator Energy Post			
Constant	.35	.49	.70
Condition	-1.14	.41	-2.77**
Cognitive Pre-Score	.27	.21	1.30
Predicting DV Cognitive Post Score			
Constant	2.10	.43	4.85**
Condition	.22	.29	.76
Perceived Restorativeness Scale	-.13	.14	.87
Valence Post	.02	.06	.31
Energy Post	-.10	.07	1.48
Cognitive Pre-Score	.29	.10	2.88*

Indirect effects

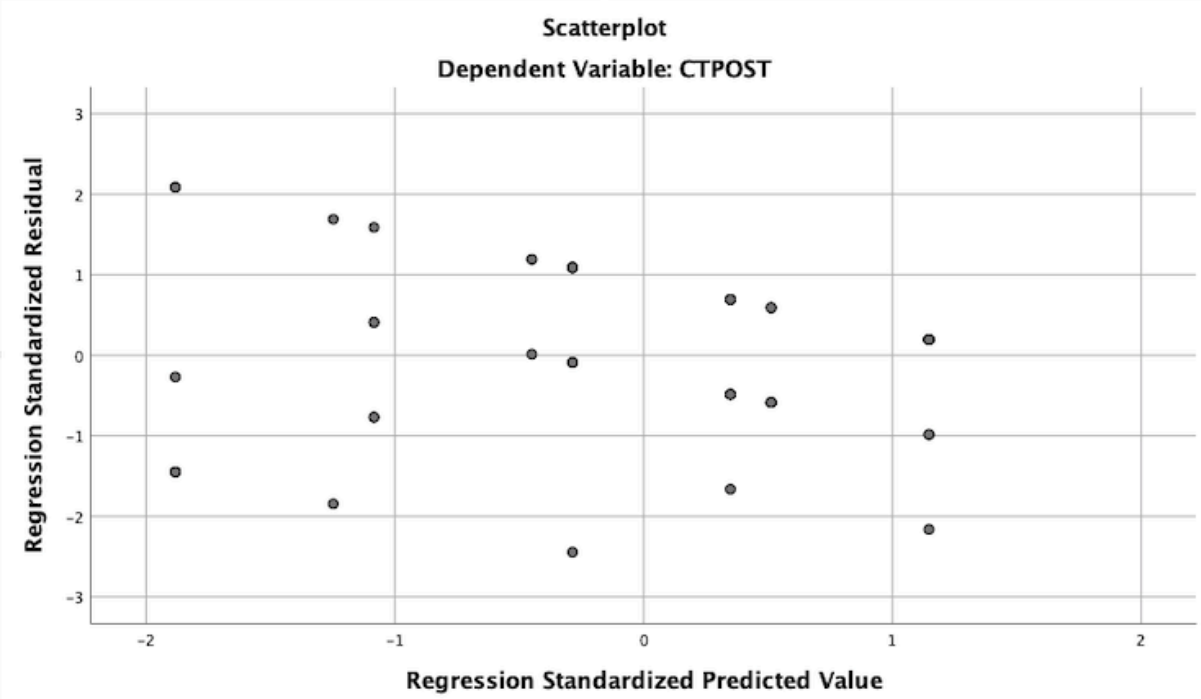
PRS = -0.19, 95% CI [-0.60, 0.28], non-significant

Valence Post = 0.03, 95% CI [-0.17, 0.25], non-significant

Energy Post = 0.14, 95% CI [-0.12, 0.39], non-significant

* $p < 0.05$, **$p < 0.01$

A11) Scatter Plot CT POST



A12) G-Power analysis